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THE

AMERICAN NATURALIST

VOL. XXVIII. January, 1894. 325

CRITICISM OF SOME CASES OF APPARENT TRANSMISSION OF MUTILATIONS.[1]

TRANSLATED FROM THE GERMAN OF DR. O. VOM RATH.

Whenever a discussion arises as to whether characters acquired in the life of the individual are transmitted, first of all is ordinarily put the special question[2] whether the transmission of mutilations may be admitted. In various papers Weismann (32) has shown that the previously known cases of alleged transmission of mutilations do not hold their ground before careful criticism, and are far from serving as indisputable proof. In the judgment of such cases so much greater care is necessary, since it is often very difficult to decide

[1] TRANSLATOR'S NOTE.—This article appeared originally in the Berichte der Naturforschenden Gesellschaft zu Freiburg, i. Bn., Bd. VI, Heft 3, and was reprinted in the Biologisches Centralblatt, Bd. XIII, No. 3, p. 65–76, from which it was translated. Especially in its striking proof of the necessity of extreme care in sifting and testing evidence, it forms a most valuable contribution to the literature of a subject which, perhaps, more than most others, has been marked by failure to apply sharply the scientific method.—*Henry B. Ward, University of Nebraska, Lincoln.*

[2] The special question of the transmission of mutilations is of the greatest importance, since a single case of such transmission, if entirely beyond question, would be sufficient to decide finally *the entire matter of the inheritance of acquired characters*, since, in that case, the possibility of the transmission of all characters acquired in the lifetime of the individual, in physical as well as intellectual relations, would also have to be granted. By the by, I should like to mention just here, that at present some authors, and with them a part of the educated laity, are inclined to deny the transmission of single injuries or mutilations, but, on the other hand, to look upon the transmission of acquired characters upon the whole as possible.

whether the abnormality present in the paternal or maternal individual was actually caused by some external interference, or arose as an inborn (blastogenic) variation of the germ. Of those authors who deny the transmission of acquired characters, the pathologist, E. Ziegler (35), approaches most closely to the Weismannian point of view, and his valuable papers in which he discusses the most recent articles on inheritance and the doctrine of descent and their importance for pathology, form important supplements to the writings of Weismann. Among other things, E. Ziegler emphasizes the fact "that pathological characters acquired in the life of the individual are not transmitted, and that the first origin of transmissable diseases and mutilations is not to be sought in the acquirement of corresponding changes during the life of one of the parents, but in variations of the germ."

It is by no means my intention to go into the extensive literature on this point.[3] The purpose of my article is rather to communicate some interesting cases of apparent transmission of mutilations, which I learned of by personal experience, and was able to test carefully. If even now some of these cases do not permit a definite decision, still it may not be useless to recount them here, since, by just such examples which, at first glance, let no doubt of the fact of such transmission appear, it can best be shown with what extreme care an unpartisan observer must prove the true character of the case, and pass judgment upon it.

Before beginning my description, let me call attention to the fact that the expression "acquired character" has been used by different authors often in a very different sense. Weismann has expressed himself on this point as follows: "Since the term *acquired character* is not taken by all the in sharply circumscribed sense in which it is used by zoologists and botanists, I propose, in cases where a misunderstanding is possible, to use,

[3] I refer especially to the important papers in the appended list, those of Weismann (32), Ziegler (35), Eimer (9), Kölliker (16), Virchow (28), Claus (5) and others. In passing, I should like to call to mind the fact that two years ago the question of the inheritance of acquired characters was discussed clearly and pregnantly by van Bemmelen (1), in a historical critical investigation, with reference to the standpoint taken by Weismann, and with a review of the most important literature.

instead of *acquired*, the word *somatogenic*, i. e., proceeding from the body—*soma*—in contrast to the germ substance, and to designate such characters as proceed from the composition of the germ as blastogenic. If a man's finger is cut off, his tetradactyl condition is a somatogenic or acquired character; if, on the other hand, a child is born with six fingers, this condition must have proceeded from the peculiar constitution of the germ substance.[4] It is therefore a blastogenic character." In this description I shall adhere to Weismann's form of expression.

The facts of the first case are as follows: In a family closely related to myself was kept a pair of dogs (terriers), faultless in every particular; both dog and slut were known to have had fully normal parents, and on their part to have produced, in several litters, normal young. By an unfortunate fall, the dog suffered a break in the upper part of the right humerus, as a result of which, even to-day, there remains a peculiar posture of the damaged extremity, connected with continued limping. In the next litter, which followed some time after the complete recovery of the father, were three young, two dogs and a slut. The fully normal young slut died soon after birth. Shortly thereafter, the mother came to her end also. Of the two young

[4] The question whether such a sharp fundamental difference as Weismann emphasizes can be made between germ and body cells, so that every trace of germ plasm is wanting in the somatic cells, has been answered in varying manner by different authors, and, for example, is distinctly denied by Kölliker (16). That moreover, among the lower plants the difference between somatic and propagating cells may be very small, has been pointed out by Weismann himself (Biol. Centr. X, No. 1–2). "DeVries (29), the noted botanist, has pointed out that certain constituents of the cell-body, e. g., the chromatophores of the algæ are transmitted directly from the egg-cell of the mother to the daughter organism, while the male germ-cells ordinarily contain no chromatophores. Here then, the inheritance of somatogenic variations would be, it seems, possible. Yet, just in the lower plants, the difference between somatic and propogating cells is still slight, and the body of the egg-cell does not need to undergo a complete transformation in chemical and structural respects when it develops into the body of the somatic cells of the daughter individual. But what has that to do with the problem whether, for instance, the pianist can transmit to his descendants the strength of digital muscles acquired by practice. How does this result of his practice reach the germ-cells? Therein lies the riddle which they have to solve who maintain the transmission of somatogenic characters." For our purpose, however, this special question comes less into consideration since one may regard the question of the transmission of acquired characters for the present, as a purely empirical one.

dogs, the one was in every respect normally formed, and in color and form the true likeness of the mother, whereas the other dog not only resembled exactly the father, but also like him possessed an abnormally placed right fore leg, and continually limped with this leg from birth up to to-day, when the animal has long since reached full growth. At the sight of the dog, all eye-witnesses were completely convinced of the fact of the transmission of a former injury.

As will be easily understood, my attention was at once directed to establishing whether the peculiarities in question really corresponded exactly in father and son. To begin with, I found that after the fall, the right fore-leg of the father was essentially different from the left, and had remained so constantly, and that the animal continually limped on this leg, and always in the same way. A certain weakness and great tenderness is noticeable even to-day in the entire shoulder region, and especially at the spot at which the injury took place; the entire musculature on the humerus is also strikingly degenerate. The position of the injured leg (especially from elbow joint down) differs in a curious way from that of the uninjured left leg. The entire extremity has a fully crippled appearance. The apparently shortened forearm and foot of the right foreleg assume unmistakably a bow-legged position, and the entire extremity is strikingly bent inward.

The investigation of the limping young dog showed the following: In spite of careful feeling I could find on the right foreleg neither a sensitive place nor an abnormity of humerus or of the musculature; on the contrary, the right foreleg is externally completely similar to the left, but unquestionably different in posture and shape from the latter. While now in the father the right leg is "O"-shaped (bow-legged), and the foot is turned inward, the corresponding leg of the young dog shows exactly the reverse tendency in posture. It is rather "X"-shaped ("knock-kneed") and the foot is turned outward, but by no means so much as the corresponding foot of the father turns inward. The difference in the posture of the leg does not strike one so much when the two young dogs are observed together as when the father and the limping one are

compared along side of each other. In the usually very active movement of the animals, moreover, the difference in the posture of the legs does not become so evident as when the animals move slowly or stand still.

In judging this case it is to be noted, first of all, that the abnormality of the young dog which might be regarded as inherited (transmitted), does not agree in many particulars, especially in regard to the posture of the leg, with the acquired deformity of the father. There is, as it appears to me, a double interpretation of the case possible. Either one may assume that the abnormality of the young dog has appeared without any inheritance as a germ variation, which is not further traceable to its causes, and that a case of transmission has only apparently arisen, since by chance the paternal animal showed an acquired abnormality of the same leg as that on which, in the young animal, an abnormality arose by variation; or, on the other hand, one may regard the acquired abnormality of the paternal animal as the cause of the congenital abnormality of the young dog; in the latter event, it must be carefully noticed that the inherited peculiarity is very little similar to the original. Hence, there would be present only a certain influence, but not such a transmission as we perceived in the case of individual variations (blastogenic changes) in which the transmitted peculiarity differs, perhaps, in degree from the transmitting, but is always like it.

As far as the limping of the two dogs is concerned, I do not think that further significance can be attributed to this circumstance. To be sure, both dogs limp on the same leg—the father always alike, the son sometimes more and sometimes less, and often scarcely noticeably; thereby is by no means proved that the same cause lies at the bottom of the limping of both animals. As is well-known, quadrupeds, and especially dogs and horses, limp in consequence of the most varied causes, and it is often very difficult to find the real ground of the linping. In the case described, the limp of the father is evidently the result of the fall. I was as little successful as other investigators in finding the true reason of the trouble in the son, since nowhere on the entire body was a tender spot to be discovered.

The following case is so simple and characteristic, that no doubt can exist as to its interpretation. A Mr. S., a perfectly normal and well-proportioned man, had from youth up, the habit of turning the tip of his right foot outward more than that of the left, a circumstance which was especially apparent in dancing, and also showed prominently in foot-prints left in the snow or on moist ground. This peculiarity all his children (three sons) have inherited, only with the difference that in one of them, besides the right, the left foot also is turned out in a like striking manner. Since now the father of Mr. S., as a young man, acquired, in consequence of an apoplectic fit, apparent lameness of the right leg, as a result of which this leg was dragged behind, with the foot strikingly turned outward, one concluded that the peculiarity of the out-turned foot inherited from the older Mr. S. (i. e., a somatogenic character) had been transmitted to his son, and in still stronger measure to his grandchildren. As I stand in close connection with the family concerned, it was easy for me to acquire the necessary information, and I was able to establish the fact that the younger Mr. S. was already several years old when his father suffered the stroke, and further, that the elder Mr. S., from youth up, had complained of a certain weakness in the right leg, and that an important deterioration in the condition of the entire leg appeared directly after the stroke. If now one wishes to bring the out-turned foot of the younger Mr. S. in connection with the infirmity of his father, a thing which, according to my view, is not at all necessary, then it can be regarded as an inherited peculiarity in both the father and the son, i. e., a blastogenic, but by no means a somatogenic character. Such habits of peculiar postures of the foot not infrequently appear suddenly and without visible cause in some person or other, without a similar case having been known in the family of the same person. I also know a man who, from youth up, had the habit of continually turning the right foot in a striking manner inward, so that it was jocosely said of him he had two left feet; but neither in parents, brothers, children, nor other relatives of the man, has ever been noticed any special inclination to a striking position of the foot.

The third case which I shall now report came to my knowledge as in my own family, in consequence of the instance just described, the question of the transmission of mutilations was actively discussed. In that connection, this case was held up to me as an absolutely trustworthy proof of the possibility, yes, of the fact of such a transmission. The case is the more interesting since it is concerned with the apparent transmission of a scar ["Schmiss"—the term applied to the duelling scars of the German students.—*Trans.*].

A Mr. H. had received, as a student, a serious saber cut, extending vertically along his right cheek, and had retained, during his entire life, the conspicuous scar. Since one of the children of the gentleman, a daughter, brought into the world, exactly on the same spot of the right cheek, a birth-mark in form of a fine red slash, the length of the father's scar, no one hesitated to bring this birth-mark into genetic connection with the cut of the father; and since, in addition, among the five children of this lady, one son also possessed from birth an equally long birth-mark, exactly on the same spot as that of his mother, no one doubted an instant that the scar of the grandfather, an acquired (somatogenic) character had been transmitted to the daughter and the grandchild. Now so convincing as indeed this case appears at first glance, it is yet very far removed from furnishing actually indisputable proof of the transmission of mutilations.

In the first place, I should not neglect to mention that I have known the family in question for many years, without the peculiar inherited birth-mark of the lady or her son ever having attracted my attention, until I was called to notice, and could confirm its actual existence. With the lady, as with her son, the characteristic family mark had been very prominent in the early years of life, it then faded gradually, without disappearing completely, however. The elder Mrs. H., grandmother of the young man, is still living, and, according to her own account, has never possessed such a birth-mark on her right cheek; at present, every trace of one is certainly lacking, so that one is inclined to think of a transmission from the side of the grandfather, the elder Mr. H. Unfortunately, this gen-

tleman died many years ago, and it was on that account impossible for me to determine whether he also did not possess from his birth, such a mark on his right cheek, the existence of which was gradually forgotten,[5] especially, as on this cheek, the large scar and a number of smaller cuts were added.

Besides this possibility, there ought not to be left out of consideration the fact that not infrequently peculiar birth-marks are brought into the world by children, without the same or similar marks ever having been observed in the family in question or among relatives. That sometime such a mark could appear in some child exactly on the spot on which the father had had a cut, is, of itself, nothing surprising, or indeed strange. In a like sense Weismann has already expressed himself, before, indeed, such a case of apparent transmission of a scar had come to light. "I, indeed, do not wish to doubt," says Weismann, "that among the many thousand students whose faces are adorned by so-called cuts, one could be found sometime whose son has a birth-mark on the precise place on which the scar of the father is found. There exist many kinds of birth-marks; why not sometime, then, one exactly on the position and exactly in the form of a scar. Then we would have here a case such as the adherents of the doctrine of the

[5] How easily such birthmarks, especially if prominent only in early childhood, come to be forgotten, may be seen from the following incident: The young man in question, who, like his grandfather, fought left-handed, and has also carried off a considerable number of cuts on his right cheek and forehead, is now father of two children, who show no trace of the family mark. The young wife of the gentleman, whom, as a relative, I have known from early childhood, brought into the world on her brow and scalp a red mark, about 6 cm. long, whereas, among grandparents, parents, sisters and other relatives, such a birth-mark has never appeared. Gradually it has grown rather indistinct, and has come to be forgotten, especially since the "bang" of the child was combed down over the naturally peculiarly high brow. I have convinced myself personally that neither the brother nor sisters of the young wife, nor her husband and other connections, had a suspicion of the existence of the mark. Yes, that she herself knew nothing of it, and could be convinced of the actual presence of this mark only by the assurance of her mother who confirmed my indiscreet statements. At present, moreover, only a very weak, scarcely perceptible trace of this mark is to be recognized. If a child of this couple had brought into the world any birth-mark whatsoever upon the brow, this mark surely would have been brought in genetic connection with one of the cuts on the forehead of the father, since the congenital mark on the mother's brow had long since lapsed into forgetfulness. One would then, with great probability, have spoken falsely of the transmission of a scar.

transmission of acquired characters have long wished, a case of which they think that it alone would suffice to overthrow the entire structure of their opponents. But how far, then, would such a case, if it were really authenticated, be more in position to establish the kind of transmission asserted than the case related by v. Baer, the claim of *Versehen*[6]? I think there lies in the very extraordinary rarity of such cases, a strong indication that there is concerned an accidental, not a causal, occurrence. If cuts could really be transmitted, we should have to expect to meet very often such birth-marks corresponding to the paternal scar, in nearly all such cases, namely, in which the son inherited the features of the father."

From the preceding description we have seen that the apparently so convincing cases of the transmission of former injuries, which I have described, surely do not speak in favor of this theory, which requires nothing less than unimpeachable proof; they accord in part with the cases discussed by Weismann, in which direct proof could be furnished that the peculiarities in

[6] In passing, I should like to mention how prevalent the belief in the *Versehen* of pregnant women still even in so-called educated circles, and should like to relate, only as a curiosity, the following case which occurred also in a family of acquaintances. A Mr. X. went driving with his daughter, who was in the fourth month of pregnancy. By an unlucky chance the pet dog of the young wife fell under the wheels, and was terribly mangled. At the sight of the bleeding animal the horrified woman made involuntarily a movement of the right hand towards the *Kreuzgegend* and behold the timely born, completely normal child, had on the same region a large blood-red spot. Mr. X. assured me that neither in his family nor in that of his wife had a similar birth-mark ever appeared, and so all were agreed that this red mark of the child must stand in direct relation to the movement of the mother at the sight of the bleeding dog. I could only express to the family my warmest congratulations that the young wife possessed such great presence of mind, joined to tender motherly love, that she made the motion of the hand towards just that region, for if, as is wont to be the rule at horrible spectacles, she had covered her eyes with her hand, then the child would have had to bring into the world a peculiar facial ornament, something in the line of a blood-red nose. To go further into detail with regard to the impossibility of the *Versehen* of pregnant women, I regard as superfluous. It is sufficiently well-known that from the moment of the fertilization of the egg by the spermatozöon, the fate of the embryo is decided, both so far as its form as well as its individual *Anlagen* are concerned. Naturally, on account of the intimate connnection of the fruit with the mother, sickness which affects the entire organism of the latter, will also work detrimentally to the embryo, but neither beautiful nor horrible appearances on the part of the pregnant can produce the slightest change in the form of the embryo.

question do not at all correspond in the child and in the father or mother (parent, Weismann), and stand in no genetic connection.

The arguments which oppose the acceptance of the theory of the inheritance of mutilations, have been discussed so much in detail, especially by Weisman and Ziegler, that I shall not refer further to them here. The objections raised have by no means grown weaker of late; they have rather been considerably strengthened by new investigations which give us a deeper insight into the character and processes of fertilization (Weismann's Amphimixis). If now there is no doubt that in the acceptance of the transmission of mutilations, and of the other peculiarities acquired in the life of the individual, the phenomena of the theory of descent find a convenient and simple explanation, this condition by no means authorizes us to an unconditional acceptance of this supposition, since, as Weismann has shown, all phenomena of the theory of descent may also be explained just as simply and unconstrainedly without the aid of the Lamarckian principle. Of special importance for the decision of the question at issue are Weismann's much discussed experiments on mice. As is known, the artificial mutilations of these animals were carried on in both parents through many generations, without any apparent success. Similar recently published experiments of Ritzema Bos, as well as those of J. Rosenthal, showed also the same negative result. If now indeed these experiments on mice, as Weismann states with especial emphasis, alone and without further evidence, by no means furnish direct proof of the claim "that injuries cannot at all be transmitted, since such experiments must be prosecuted even to infinity: yet, indeed, after these unanimously negative results, the possibility of the transmission of single mutilations can be put entirely aside, and the [inheritance of?—*Trans.*] mutilations repeated on both parents through many generations, appear at least very improbable. I, as little as Weismann, Ziegler, and others, desire to doubt that modifying influence of external interference and stimulus on the germ plasm. One can be easily convinced of this, that change of climate, altered conditions of temperature, light and

moisture, different manner of nourishment, transform entirely unmistabably the organism of plant and animal, and there is nothing in the way of the opinion that by the continued working of such external influences and stimuli the molecular structure of the germ plasm also experiences a change which can lead to a transmission of the transformations. Above all, it ought not to be forgotten in this case that the somatic cells are in no way the first to be modified by the stimulus, and that then by some sort of unexplained process (Pangenesis, or intracellular pangenesis) this stimulus is transmitted gradually by these cells to the plasma of the germ cells. The influence on the germ plasm is rather a direct one, and if, by continued influence, a transformation of the structure of this plasm takes place and transmission occurs, then we have simply a transmission of blastogenic, by no means of somatogenic characters, and therein is not the slightest admission of the transmission of acquired characters.

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